

Serbia PRTR Implementation Overview – Guidelines for Emission Calculation

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Different kind of Guidelines in SEPA

- Guidelines for using SEPA IT system
- Guidelines for form filling
- Guidelines for emission calculation

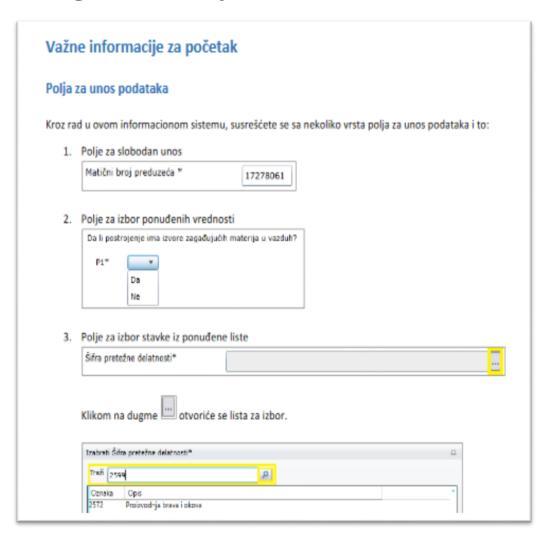
These Guidelines have the purpose of reducing the possibility of errors in the calculation of emissions of pollutants into the air

Guidelines for using SEPA IT system

- 19 pages guidelines with all necessary informations for operators.
- With many pictures directly from software

Problem

 It is easier to call on phone and ask than to read simple guideline.





Guidelines for form filling

 All Serbian legislation which have a reporting obligation includes instructions for filling out forms for each field separately.

Problem

It is easier to call on phone and ask than to read simple guideline.

Порески иденти- фикациони број (ПИБ)	Унети порески идентификациони број предузећа (9 цифара)			
Матични број предузећа	Унети матични број предузећа (8 цифара)			
Пун назив предузећа	Унети пун назив предузећа			
Место	Унети место у коме се предузеће налази			
Шифра места	Унети шифру места			
\odot	Обавезно погледати - Систематски списак насеља Републике Србије по окрузима и општинама, Републичког завода за статистику.			
?	Потребно је пронаћи назив општине у Систематском списку насеља Републике Србије по окрузима и општинама и у оквиру ње наћи назив места, у колони поред се налази шифра места			
Поштански броі	Vнети поштански блоі места			



Guidelines for emission determination

The release and transfer data on pollutants reported per facility can be based on three different principal determination methods:

- a) Measurements using standardized or accepted methods; often, additional calculations are needed to convert the results of measurements into annual emission data;
- b) Calculations using nationally or internationally agreed estimation methods and emission factors, which are representative for the industrial sectors;
- c) Estimations (non-standardized) derived from best assumptions or expert guesses. Estimation is particularly relevant when reporting on accidental releases, as data on such releases are not necessarily immediately avalirale to the operator.



Guidelines for emission determination

Table 13: Different types of determination methods for estimating releases and transfers of pollutants from facilities and classification as measurement (M), calculation (C) or estimation (E) (UNITAR, 1997)

Type of measurement	Classification for PRTR
I. Direct Measurement	М
- Fugitive Air Emissions	M
- Measuring Point Source Air Emissions	M
- Measuring Surface Water Discharges	M
- Measuring Releases to Land	M
II. Materials Accounting and Mass Balance	С
- Estimating Fugitive Air Emissions by Materials Accounting	С
- Estimating Point Source Air Emissions by Materials Accounting	С
- Estimating Surface Water Discharges by Materials Accounting	С
- Estimating Releases to Land by Materials Accounting	С
III - Emission Factors	С
- Estimating Fugitive Air Emissions with Emission Factors	С
- Estimating Point Source Air Emissions with Emission Factors	С
- Estimating Surface Water Discharges and Releases to Land with Emission Factors	С
IV. Engineering Calculation	C/E
- Estimating Fugitive Air Emissions by Engineering Calculation	C/E
- Estimating Point Source Air Emissions by Engineering Calculation	C/E
- Estimating Surface Water Discharges by Engineering Calculation	C/E
- Estimating Releases to Land by Engineering Calculation	C/E

Guidance on Implementation of the Protocol on PRTR



The basis for guidelines developing are:

- ✓ 2016 EMEP/EEA air pollutant emission inventory guidebook
- ✓ 2006 IPCC Guidelines for National Inventories version 2015



Algorithm

The Tier 1 approach equation for emissions calculation is

$$E_{\text{pollutant}} = AC \times EF_{\text{pollutant}}$$

 $E_{pollutant}$ - annual emission of pollutant $EF_{pollutant}$ - emission factor of pollutant

AC - activity data

Activity data

Activity data, according to the IPCC Guidelines for National Greenhouse Gas Inventories, are defined as data on the magnitude of human activity resulting in emissions or removals taking place during a given period of time.

Emission factors

An emission factor is defined as the average emission rate of a given GHG for a given source, relative to units of activity.

Table 3-2 Tier 1 emission factors for source category 1.A.1.a using hard coal

Tie	r 1 default en	nission fac	tors		
Code	ode Name				
1.A.1.a	Public electr	icity and he	at producti	on	
Hard Coa					
NH3					
Value	Unit			Reference	
		Lower	Upper		
209	g/GJ	200	350	US EPA (1998), chapter 1.1	
8.7	g/GJ	6.15	15	US EPA (1998), chapter 1.1	
1.0	g/GJ	0.6	2.4	US EPA (1998), chapter 1.1	
820	g/GJ	330	5000	See Note	
11.4	g/GJ	3	300	US EPA (1998), chapter 1.1	
7.7	g/GJ	2	200	US EPA (1998), chapter 1.1	
3.4	g/GJ	0.9	90	US EPA (1998), chapter 1.1	
	Code 1.A.1.a Hard Coal NH3 Value 209 8.7 1.0 820 11.4 7.7	Code Name 1.A.1.a Public electr Hard Coal NH3 Value Unit 209 g/GJ 8.7 g/GJ 1.0 g/GJ 820 g/GJ 11.4 g/GJ 7.7 g/GJ	Code Name 1.A.1.a Public electricity and he Hard Coal NH3 Value Unit 95% cor inte Lower Lower 209 g/GJ 200 8.7 g/GJ 6.15 1.0 g/GJ 0.6 820 g/GJ 330 11.4 g/GJ 3 7.7 g/GJ 2	1.A.1.a Public electricity and heat production NH3 Value Unit 95% confidence interval Lower Upper 209 g/GJ 200 350 8.7 g/GJ 6.15 15 1.0 g/GJ 0.6 2.4 820 g/GJ 330 5000 11.4 g/GJ 3 300 7.7 g/GJ 2 200	

NOx	Category	1 A 1 a									
NOx	Name	Public electricit	/ and heat pr	oduction							
NOx	-										
NOx	-										
NAME of fuel Brown coal Emission factors table 3-3 September Septe											Other (from 1980)
Name of fuel Brown coal Emission factors table 3-3 Unit of measure				NMVOC		NH ₃	PM _{2.5}	PM ₁₀	TSP	ВС	со
Emission factors table 3-3 Emission factor 247 1,4 1350 Unit of measure Correction factor 1000000000 1000000000 1 1000000000 1 1000000			kt	kt	kt	kt	kt	kt	kt	kt	kt
Emission factors table 3-3 Emission factor 247 1,4 1350 Unit of measure Correction factor 1000000000 1000000000 1 1000000000 1 1000000											
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Emission factor 247 1,4 1350 7,9 11,7 1 8,7 Unit of measure g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ % of PM _{2.5} g/GJ Correction factor 1000000000 1000000000 1 1000000000 1000000000 1 100000000 1990 290078277 71,6493 0,4061 391,6057 NA 0,9283 2,2916 3,3939 0,0093 2,53 1991 247198934 61,0581 0,3461 333,7186 NA 0,7910 1,9529 2,8922 0,0079 2,11	Name of fuel	Brown coal									
Unit of measure g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ g/GJ % of PM _{2.5} g/GJ	Emission factors						emisioni faktor	r			
Unit of measure Correction factor 10000000000 10000000000 1 1000000000 1000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 100000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 10000000000 <th< th=""><th>Emission factors</th><th>3-3</th><th></th><th></th><th></th><th></th><th>emisioni faktor</th><th>,</th><th></th><th></th><th></th></th<>	Emission factors	3-3					emisioni faktor	,			
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1991 247198934 61,0581 0,3461 333,7186 NA 0,7910 1,9529 2,8922 0,0079 2,1	Emission factors table	3-3 Emission factor				Nacionalni		7,9			8,7 g/GJ
	Emission factors table	3-3 Emission factor Unit of measure	g/GJ	g/GJ	g/GJ	Nacionalni	∎ g/⊍J	7,9 g/GJ	g/GJ	% of PM _{2.5}	
1992 2/2523672 60 1503 0 3/09 328 7570 NA 0 7793 1 9229 2 8/02 0 0078 2 4	Emission factors table	3-3 Emission factor Unit of measure Correction factor	g/GJ 1000000000	g/GJ 1000000000	g/GJ 1000000000	Nacionalni -	1000000000	7,9 g/GJ	g/GJ 1000000000	% of PM _{2.5}	g/GJ
1372 24322012 00,1303 0,3405 320,1310 NA 0,1153 1,5236 2,0452 0,0016 2,1	Emission factors table	3-3 Emission factor Unit of measure Correction factor 290078277	g/GJ 1000000000 71,6493	g/GJ 1000000000 0,4061	g/GJ 1000000000 391,6057	Nacionalni 1	1000000000 0,9283	7,9 g/GJ 1000000000 2,2916	g/GJ 1000000000 3,3939	% of PM _{2.5} 1 0,0093	g/GJ 1000000000
1993 255589497 63,1306 0,3578 345,0458 NA 0,8179 2,0192 2,9904 0,0082 2,2	Emission factors table	3-3 Emission factor Unit of measure Correction factor 290078277	g/GJ 1000000000 71,6493	g/GJ 1000000000 0,4061	g/GJ 1000000000 391,6057	Nacionalni 1	1000000000 0,9283	7,9 g/GJ 1000000000 2,2916	g/GJ 1000000000 3,3939 2,8922	% of PM _{2.5} 1 0,0093	g/GJ 1000000000 2,5237
1994 259162071 64,0130 0,3628 349,8688 NA 0,8293 2,0474 3,0322 0,0083 2,2	Emission factors table 1990 1991 1992	3-3 Emission factor Unit of measure Correction factor 290078277 247198934 243523672	g/GJ 1000000000 71,6493 61,0581 60,1503	g/GJ 1000000000 0,4061 0,3461 0,3409	g/GJ 1000000000 391,6057 333,7186 328,7570	Nacionalni 1 NA NA NA	1000000000 0,9283 0,7910 0,7793	7,9 g/GJ 1000000000 2,2916 1,9529 1,9238	g/GJ 1000000000 3,3939 2,8922 2,8492	% of PM _{2.5} 1 0,0093 0,0079 0,0078	g/GJ 1000000000 2,5237 2,1506
1995 264365329 65,2982 0,3701 356,8932 NA 0,8460 2,0885 3,0931 0,0085 2,38	Emission factors table 1990 1991 1992 1993	3-3 Emission factor Unit of measure Correction factor 290078277 247198934 243523672 255589497	g/GJ 1000000000 71,6493 61,0581 60,1503 63,1306	g/GJ 1000000000 0,4061 0,3461 0,3409 0,3578	g/GJ 1000000000 391,6057 333,7186 328,7570 345,0458	Nacionalni 1 NA NA NA NA	1000000000 0,9283 0,7910 0,7793 0,8179	7,9 1000000000 2,2916 1,9529 1,9238 2,0192	g/GJ 1000000000 3,3939 2,8922 2,8492 2,9904	% of PM _{2.5} 1 0,0093 0,0079 0,0078 0,0082	g/GJ 1000000000 2,5237 2,1506 2,1187
1996 242171701 59,8164 0,3390 326,9318 NA 0,7749 1,9132 2,8334 0,0077 2,10	Emission factors table 1990 1991 1992 1993 1994	3-3 Emission factor Unit of measure Correction factor 290078277 247198934 243523672 255589497 259162071	g/GJ 1000000000 71,6493 61,0581 60,1503 63,1306 64,0130	g/GJ 1000000000 0,4061 0,3461 0,3409 0,3578 0,3628	g/GJ 1000000000 391,6057 333,7186 328,7570 345,0458 349,8688	Nacionalni 1 NA NA NA NA NA NA	1000000000 0,9283 0,7910 0,7793 0,8179 0,8293	7,9 1000000000 2,2916 1,9529 1,9238 2,0192 2,0474	g/GJ 1000000000 3,3939 2,8922 2,8492 2,9904 3,0322	% of PM _{2.5} 1 0,0093 0,0079 0,0078 0,0082 0,0083	g/GJ 1000000000 2,5237 2,1506 2,1187 2,2236

These guidelines are part of Serbian bylaws.

Their use is obligatory.

 Rules on the methodology for the development of national and local register of pollution sources and methodology for the type, method and time of data collection ("RS Official Gazette", Nos. 91/2010, 10/2013 and 98/2016)

document	Download	Directions and emission calculators
The text of the Ordinance amending the Ordinance 98/2016	1	
The text of the Ordinance Amending Ordinance 10/2013	1	
text Rules	1	
Attachment 1.	1	
Appendix 2.	1	
Appendix 3.	1	
Appendix 4.	1	
Appendix 5.		
5.1 Broilers	1	×
5.2 Laying hens	1	×
5.3 pigs and sows	1	×
Form 1.	1	
Form 2.	1	

Guidelines for PRTR facilities which are diffuse sources such as:

- ✓ Livestock
 - Broilers
 - Laying hens
 - Pigs and sows
- ✓ Mining
- ✓ Landfills

Pollutants

For the purposes of reporting according to the National Register of Pollution Sources from broilers and other livestock farms, the quantities of the following pollutants emitted into the air are determined:

- 1. methane (CH_4);
- 2. nitrogen monoxide (NO);
- 3. ammonia (NH_3) , and
- 4. suspended solid particles (PM_{10}).

Sources

There are five main sources of emission from broilers farms and other live poultry:

- animal nutrition (PM, CH₄);
- way of livestock production and environmental maintenance (NH₃, PM, NMVOC);
- storage of manure (NH₃, NO, NMVOC, CH₄);
- 4. application of manure in the fields (NH₃, NO, NMVOC);
- 5. generated manure during outdoor living (CH₄, NH₃, NO, NMVOC).

Methodology

Calculation of the amount of air pollutants emitted from the farms of the cattle and other livestock is based on the equation:

$$E_{_{3.M.}} = \Pi\Gamma E_{_{3.M.} \times E} \Phi_{_{3.M./_{3MB./_{100}}}}$$

wherein:

E_{3.M.} Quantity of emitted pollutants

ΠΓΕ _{жив.} Average annual number of animals

 $\mathbf{E}\Phi_{\mathtt{3.M./жив./год.}}$ Emission factor of polluting substance per animal / year

Steps

The calculation of the amount of air pollutants emitted to farms for laying hense consists of three steps.

- Step 1. Define the appropriate livestock categories that are farmed and calculate the average annual number of animals in each category.
- Step 2. Find the appropriate emission factor for each category of animals in the emission factor tables.
- Step 3. Calculate the quantities of certain emitted pollutants.

Every step has been explained in details.

Tables for activity data

Табела 2 Прорачун броја хранидбених дана у току године

Редни број	Број узгојених	Број дана	Број хранидбених		
турнуса у	животиња у току	трајања	дана у турнусу		
току године	турнуса	турнуса	Г=Б х В		
A	Б	В	Γ		
1.					
2.					
3.					
4.					
5.					
6.					
7.					
ЗБИР БРОЈА	ЗБИР БРОЈА ХРАНИДБЕНИХ ДАНА У ТОКУ				
	ГОДИНЕ				

Emission factors

Емисиони фактори за категорију: Гајење бројлера

Загађујућа материја	Емисиони фактор	Јединица
NMVOC	0.108	kg/по животињи/годишње
NH_3	0.22	kg/по животињи/годишње
PM_{10}	0.069	kg/по животињи/годишње
NO	0.001	kg/по животињи/годишње
CH ₄	0.01	kg/по животињи/годишње

Емисиони фактори за категорију: Гајење патака

Загађујућа материја	Емисиони фактор	Јединица
NMVOC	0.489	kg/по животињи/годишње
NH_3	0.68	kg/по животињи/годишње
PM_{10}	0.14	kg/по животињи/годишње
NO	0.004	kg/по животињи/годишње
CH ₄	0.01	kg/по животињи/годишње

Emission calculation

Табела 3. Прорачун емисија у ваздух са фарми

Врста животиња	Просечни годишњи број животиња на фарми	Загађују ћа материја	Емисиони фактор kg/жив/год.	Количина емитоване загађујуће материје kg/год.
A	Б	В	Γ	$\mathbf{\Pi} = \mathbf{F} \times \mathbf{\Gamma}$

Табела 4. Рекапитулација

Загађујућа материја из колоне В	Емитоване количине из колоне Д (kg/год)	Укупна емитована количина (kg/год)

Examples

Пример 2.

Фарма има капацитет 50.000 бројпера. У току године имала је четири турнуса са различитим искоришћењем и трајањем турнуса:

- 1. 50.000 бројпера/ 42 дана
- 2. 40.000 бројпера/ 45 дана
- 3. 20.000 бројпера/ 40 дана
- 4. 45.000 бројпера/ 40 дана

Број хранидбених дана

Редни број	Број узгојених	Број дана	Број хранидбених дана	
турнуса у току	животиња у току	трајања	у турнусу	
године	турнуса	турнуса	Г=Б х В	
A	Б	В	Γ	
1	50000	42	2100000	
2	40000	45	1800000	
3	20000	40	800000	
4	45000	40	1800000	
5				
6				
7				
ЗБИР БРОЛ	6500000			
	ЗБИР БРОЈА ХРАНИДБЕНИХ ДАНА У ТОКУ ГОДИНЕ			

Просечни годишњи број животиња на фарми:

$$\Pi\Gamma$$
Б жив. = $\frac{{
m Epoj}\ {
m xpahu}_{
m d}{
m Gehux}\ {
m daha}}{365}$

$$\Pi\Gamma\text{Б жив.} = \frac{6.500,000}{365} = \textbf{17.808}$$

Emission calculator

- ✓ Easy to use tool
- ✓ Simple Excel file
- ✓ The values from
- ✓ yellow cells must be typed into air emission PRTR forms

	Гајење бро	јлера		
Редни број турнуса у току године А	Број узгојених животиња у току турнуса Б	Број дана трајања турнуса В	Број хранидбених дана у турнусу Г Г=Б х В	
1	0	0	0	
2	0	0	0	Улазни подаци
3	0	0	0	
4	0	0	0	
5	0	0	0	
6	0	0	0	
7	0	0	0	
ЗБИР БРОЈА ХР	АНИДБЕНИХ ДАНА У ТОКУ Г	одине	0	
ПРОСЕЧНИ ГОДИШЊИ БРОЈ ЖИВОТИЊА	0			
Загађујућа материја	Емисиони фактор kg/AAП/god.	Емитована количина (kg/god)		
NMVOC	0,108	0,00	важно!	
NH ₃	0,22	0,00	ВАЖНО! Подаци из жуто обојених поља се уносе у образац 2.	
PM ₁₀	0,069	0,00	польа се улосе у образ	au, 2.
NOx (укупнен аксад и N из расчинен кака NO2)	0,001	0,00		
CH ₄	0,01	0,00		



Future activities

Development of Guidelines for emission calculation for energy, industry and other sectors.

This project is supported by UNECE PRTR protocol.

Guidelines on different languages:

- Serbian
- Russian
- Albanian
- All other WB countries.

THANK YOU FOR YOUR ATTENTION!